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मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

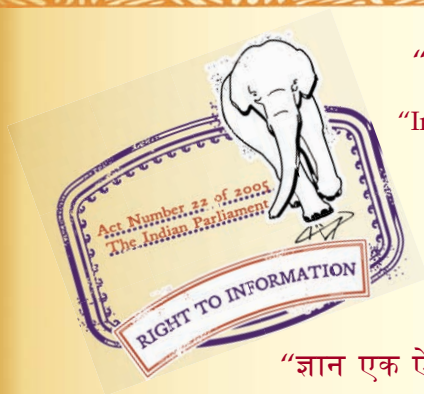
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 12367 (1988): Cold-rolled Carbon Steel Strips/Coils for
Manufacture of Welded Tubes [MTD 4: Wrought Steel Products]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR COLD-ROLLED CARBON STEEL STRIPS/COILS FOR MANUFACTURE OF WELDED TUBES

1. Scope — Covers the requirement for cold-rolled annealed/skin passed carbon steel strip coils intended for the manufacture of welded precision tube.

2. Supply of Material — The general requirements relating to the supply of material shall be in accordance with IS : 8910-1978 'General technical delivery requirements for steel and steel products.

3. Manufacture — Strip/coils may be made from steel manufactured by open hearth, electric, acid bessemer, duplex, basic oxygen or combination of these processes.

4. Chemical Composition

4.1 Ladle Analysis — The ladle analysis of steel when carried out by the method specified in the relevant parts of IS : 228 'Methods for chemical analysis of steels (*second revision*)' or any other established instrumental/chemical method, shall be as given in Table 1. In case of dispute, the procedure given in IS : 228 and its relevant parts shall be the referee method. However, where the method is not given in IS : 228 and its relevant parts, the referee method shall be as agreed to between the purchaser and the manufacturer.

4.2 Product Analysis — Permissible variations in the case of product analysis from the limits specified in Table 1 shall be as given in Table 2.

5. Tensile Test

5.1 Number of Tensile Tests — One tensile test shall be taken from each lot of 50 tonnes of material or part thereof from each cast. However, in the cast of material supplied after heat-treatment, one tensile test shall be conducted for each heat-treatment batch or a lot of 50 tonne, whichever is less.

5.1.1 In the case of material, supplied in coils, one tensile test shall be conducted from 25 tonne or the nearest equivalent whole number of coils.

5.1.2 Where strip of more than one thickness are rolled from the same cast, one additional tensile test shall be made for each thickness of strip/coil.

5.2 Tensile Test Pieces — Tensile test pieces shall normally be cut transverse in the direction of rolling. Longitudinal test piece may be cut in the case of strips having width less than 250 mm.

5.2.1 When tested in accordance with IS : 1663-1972 Method for testing of steel sheet and strip of thickness 0.5 to 3 mm (*first revision*), or IS : 1608-1972 'Method for tensile testing of steel products (*first revision*), the tensile strength, yield strength and percentage elongation shall be as given in Table 3.

5.2.2 Should a test piece break outside the middle half of its gauge length and its percentage elongation obtained is less than specified, the test may be discarded at the option of the manufacturer and another test made from the sample selected representing the same cast and batch.

5.3 Recommended hardness values for drawing, deep drawing and extra deep drawing grades in as delivered condition for annealed/skin passed strips/coils are as given below:

Grade	Hardness (Max)	
	HB	HR (30 T)
Drawing	65	60
Deep drawing	57	55
Extra deep drawing	50	50

Adopted 20 April 1988

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TABLE 1 LADLE ANALYSIS
(Clauses 4.1 and 4.2)

Grade	Constituents, Percent, Maximum			
	Carbon	Manganese	Sulphur	Phosphorus
(1)	(2)	(3)	(4)	(5)
Fe 310	0.15	0.60	0.05	0.05
Fe 380	0.20	0.80	0.05	0.05
Fe 470	0.25	0.90	0.05	0.05
Fe 540	0.25	1.00	0.05	0.05
Drawing (D)	0.12	0.50	0.050	0.050
Deep drawing (DD)	0.10	0.45	0.035	0.035
Extra deep drawing (EDD)	0.08	0.40	0.030	0.030

Note 1 — Steels of these grades can be supplied with the addition of micro-alloying elements like boron, titanium, niobium and vanadium. The micro-alloying elements shall not exceed 0.10 percent in case of boron and 0.2 per cent in case of other elements.

Note 2 — The nitrogen content of the steel shall not be more than 0.007 percent. For aluminium killed or silicon-aluminium killed, the nitrogen content shall not exceed 0.012 percent. This has to be ensured by occasional checking.

Note 3 — Grade EDD shall be supplied in fully killed condition only.

Note 4 — When the steel is aluminium killed, the total aluminium content shall not be less than 0.02 percent. When the steel is silicon killed the silicon content shall not be less than 0.1 percent. When the steel is aluminium-silicon killed, the silicon content shall not be less than 0.03 percent and total aluminium content shall not be less than 0.01 percent.

Note 5 — Restricted chemistry for EDD grade may be mutually agreed between the purchaser and the supplier.

TABLE 2 PRODUCT ANALYSIS
(Clause 4.2)

Constituent	Variation Over the Specified Maximum Limit, Percent, Max
Carbon	0.02
Sulphur	0.005
Phosphorus	0.005
Manganese	0.04

Note — The product analysis shall not be applicable for rimming quality steel.

TABLE 3 MECHANICAL PROPERTIES
(Clause 5.2.1)

Grade	Tensile Strength, MPa, Min	Yield Strength, MPa, Min	Percentage Elongation, Min on 5.65 $\sqrt{S_0}$	Recommended Hardness in HV-10
(1)	(2)	(3)	(4)	(5)
Fe 310	310	160	35	110
Fe 380	380	240	25	140
Fe 470	470	310	20	170
Fe 540	540	350	17	

6. Reverse Bend Test

6.1 Number of Reverse Bend Test Pieces — One reverse bend test shall be taken from each lot of 50 tonnes of material or part thereof from each cast. However, in the case of material supplied after heat treatment, one reverse bend test shall be conducted for each heat-treated batch or a lot of 50 tonnes whichever is less.

6.1.1 When material is supplied in coils, one reverse bend test shall be conducted from either end of the coil.

6.1.2 Where strip/coil of more than one thickness are rolled from the same cast, one additional reverse bend test shall be made for each thickness of strip.

6.2 Reverse bend test shall be carried out according to 'IS : 1403-1986 Method for reverse bend test of metals (*first revision*)'. Minimum number of reverse bend observed without any crack or failure shall be as follows:

<i>Grade</i>	<i>Minimum Number of Reverse Bends</i>
Fe 310	2·5
Fe 380	1·5
Fe 470	1·0
Fe 540	1·0
Drawing (D)	3·0
Deep drawing (DD)	3·0
Extra deep drawing (EDD)	3·0

7. Cupping Test

7.1 One cupping test shall be carried out from each lot of five tonnes of material or part thereof from each cast. In case of coils, one Erichsen cupping test shall be carried out on each coil.

7.1.1 Where strips/coils of more than one thickness are rolled from the same cast, one additional cupping test shall be made for each thickness of strip/coil.

7.1.2 Cupping test shall be applicable only for strip/coil of drawing, deep drawing and extra deep drawing types having thickness from 0·5 mm up to and including 2·00 mm.

7.2 Cupping test shall be carried out in accordance with IS : 10175-1982 'Modified Erichsen cupping test for metallic sheet and strip'.

7.3 Requirements — The minimum Erichsen values shall be as given in Fig. 1.

Note — The minimum Erichsen values are applicable only at the time of despatch. On prolonged storage, the cupping performance is likely to decline.

8. Strain-ageing Embrittlement Test

8.1 Strain-ageing embrittlement test is applicable only to strip/coils of drawing, deep drawing and extra deep drawing types, and shall be carried out according to the agreement between the manufacturer and the purchaser.

8.2 The method of carrying out the test shall be as specified in 8.2.1 to 8.2.4.

8.2.1 The test piece, 75 mm long and 25 mm wide, shall be cut so that the longer axis is at right angle to the direction of rolling. The edges of the test piece may be rounded and smoothed longitudinally to an approximately semi-circular contour.

8.2.2 The test piece shall be bent cold through 90° round a former having its diameter equal to three times its thickness. The axis of the bend shall be parallel to the direction of rolling.

8.2.3 The test piece shall then be heated to $250 \pm 5^{\circ}\text{C}$ and maintained at that temperature for 15 minutes and then cooled in still air to room temperature.

8.2.4 The test piece shall, when straightened by hammer blows on the apex of the bend, flatten without breaking.

9. Retests

9.1 Should any one of the test pieces first selected fail to pass any of the tests specified in this standard, two further samples shall be selected from the same lot for testing in respect of each failures. Should the test pieces from both these additional samples pass, the material represented by the test samples shall be deemed to comply with the requirement of that particular test. Should the test pieces from either of these additional test samples fail, the material represented by the test samples shall be deemed as not conforming to the standard.

10. Surface Finish

10.1 Surface Finish — Strips/coils shall be supplied in any one of the following surface finishes.

- Bright** — Produced on rolls having a moderately high finish. It is suitable for most requirements, but not generally for electroplating.
- Matt** — Produced on specially roughened rolls which makes it suitable for deep drawing.
- Rough** — Suitable for enamelling and lacquering.

- d) *Plating* — Produced in certain thinner sizes by using specially prepared rolls and selected raw materials to give a surface essentially free from defects. Such strips require less preparation before electroplating than those with a commercially bright finish.
- e) *Mirror* — Produced for plating finish, but with a higher lustre and reflectivity.
- f) *Dark annealed* — Bluish grey tempering colours and adherent layers of scales are permissible.
- g) *Blue* — Air tempered at a lower temperature than dark annealed to give a light blue oxide coating without any adherent layer of scale.

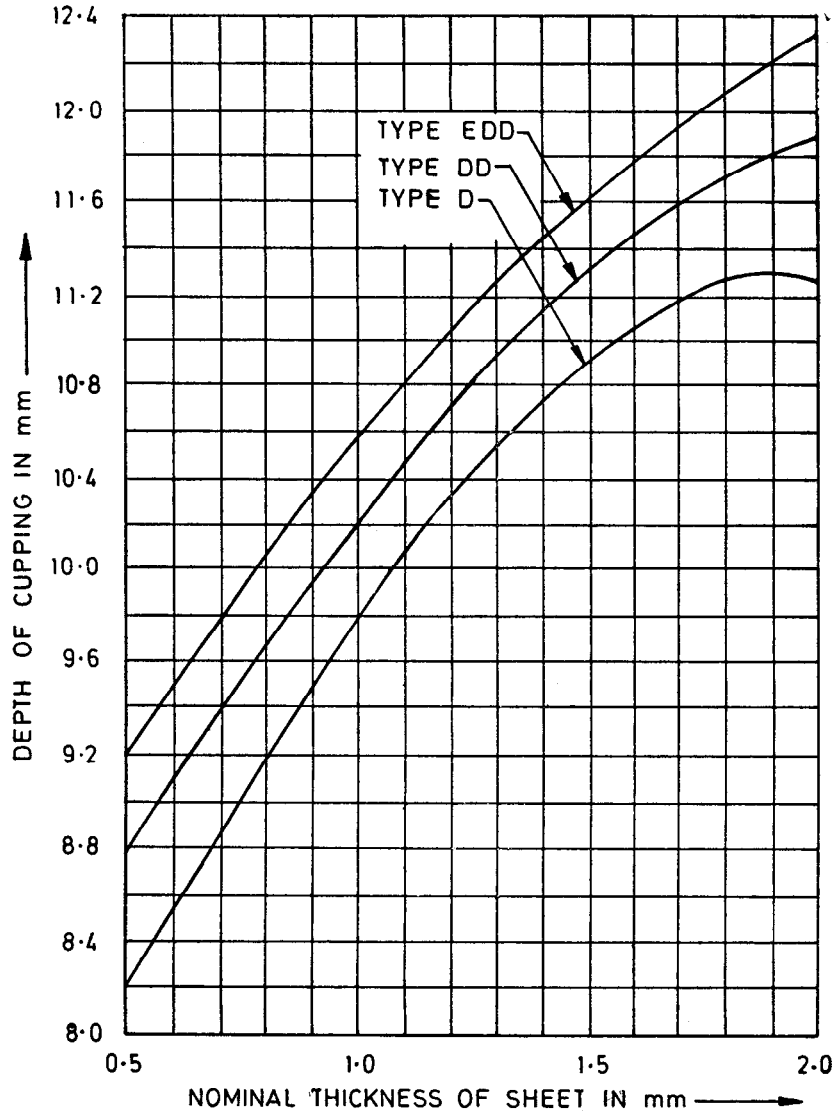


FIG. 1 MINIMUM ERICHSEN VALUES

11. Freedom from Defects

- 11.1 The finished strips/coils shall be free from harmful defects, such as scales, rust, blisters, laminations, pitting, porosity, cracked or torn edges or any other defects which will impair spot welding and uniform appearance of painted, electroplated and enamelled surface.
- 11.2 The degree or amount of surface defects in a coil may be expected to be more than in cut lengths because of the impossibility of rejecting portions of coil. This shall be taken into account by the purchaser in this assessment of the material. An excessive amount of defects may be the cause for rejection.
12. Dimensions — Nominal dimensions and thickness of cold rolled steel strip/coil may be according to mutual agreement between the purchaser and the manufacturer.

13. Tolerances

13.1 Thickness Tolerances — The tolerance on thickness shall be ± 8 percent for all thickness of the strip/coil.

13.2 Mass Tolerance — Tolerance on mass of individual strip/coil shall be ± 4 of theoretical mass. The theoretical mass of material shall be calculated on the basis that steel weighs 7.85 g/cm³.

13.3 Width Tolerance — The variation of width from the specified value shall not be more than the tolerance given below:

Width	Tolerance
Up to and including 600 mm width	— 0 + 6 mm
Over 600 mm width	— 0 + 30 mm

13.4 The edge camber, that is, the lateral departure of the edge of the material from a straight line forming a chord (see Fig. 2) of cold-rolled steel strip/coil shall not exceed the tolerance given below:

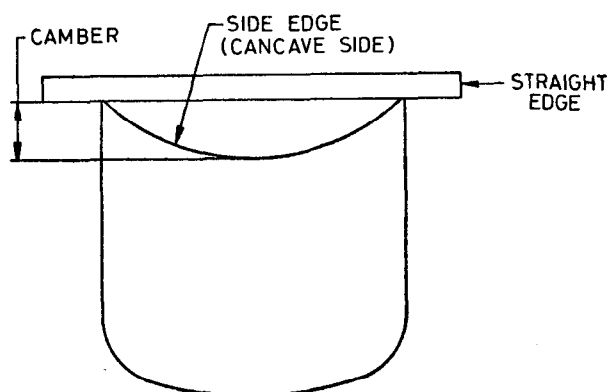


FIG. 2 EDGE CAMBER

Form	Tolerance, Max
Cut lengths	0.4 percent $\times$ length
Coils	20 mm in any 5 000 mm length

Note — Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with straight edge.

14. Delivery and Packing

14.1 These coils/strips may be supplied in fully annealed and skin passed condition as agreed to between the manufacturer and the supplier.

14.2 Coils/strips shall be securely packed in waterproof paper or hessian cloth and securely tied with wooden battens underneath to prevent the strips/coils from rusting and damage during transit.

15. Marking

15.1 Coil/strip shall be marked with the following:

- Name or trade-mark of the manufacturer,
- Grade of steel,
- Cast or identification mark, and
- Mass.

15.1.1 The material may also be marked with the Standard Mark. Details available with the Bureau of Indian Standards.

EXPLANATORY NOTE

This standard has been formulated with a view to guiding the manufacturer regarding the quality of cold-rolled carbon steel strips/coils used in the manufacture of welded precision tubes which are widely used in engineering applications such as those covered by IS : 2039-1981 'Specification for steel tubes for bicycle and allied purposes (*first revision*)', IS : 3074-1979 'Specification for steel tubes for automotive purposes (*first revision*)' and IS : 3601-1984 'Specification for steel tubes for mechanical and general engineering purposes (*first revision*)'.